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THE COMPOSITION, STRUCTURE, AND PHENOLOGY OF THE VEGETATION AT THE O. E. ANDERSON COMPASS-PLANT PRAIRIE IN UNGLACIATED SOUTHEASTERN OHIO[1]

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ABSTRACT. The O. E. Anderson Compass-Plant Prairie, located in the unglaciated hill country of southeastern Ohio (Lawrence Co.), currently represents the only known extant occurrence of *Silphium laciniatum* (compass-plant) in Ohio. Some prairie indicator species present include *Andropogon Gerardi, A. scoparius, Sorghastrum nutans, Panicum virgatum, Sporobolus asper,* and *Silphium laciniatum.* The vegetation is dominated on a quantitative basis by *Andropogon scoparius* with *Rubus* spp., *Rhus Copallinum, Rosa carolina* and *Carex complanata* as subdominants. Phenologically the site exhibits three flowering pulses, one in late May and two in August. Vegetative differences between the prairie and a nearby pasture were primarily quantitative and not qualitative. The prairie species at this site may be adventive as a result of agricultural activities.

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INTRODUCTION

Prairies in Ohio have a discontinuous distribution with most occurring in the glaciated portion of the state (Gordon 1966). The presence of prairie communities within the unglaciated and heavily forested hill country of southern Ohio has been of considerable interest to plant ecologists (Sears 1926, 1942, Braun 1928, Transeau 1935, Jones 1944, Wistendahl 1975, Cusick and Troutman 1978). Sears (1942) suggested that such prairies were evidence of a warmer, drier period than now exists in the region. Transeau (1935) considered the Ohio prairie vegetation as part of the Prairie Peninsula, being a distinctive part of the tallgrass prairie extending eastward into the eastern deciduous forest.

The O. E. Anderson Compass-Plant Prairie is located well within the limits of the eastern deciduous forest as defined by Braun (1950) and is particularly noteworthy among Ohio plant communities in that it currently represents the only known extant occurrence of *Silphium laciniatum* (compass-plant) in the state. The site was acquired by the Ohio Chapter of The Nature Conservancy through the efforts of O. E. Anderson and was dedicated in 1981 as a State Nature Preserve by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves.

The location of prairie vegetation and the unique occurrence of *Silphium laciniatum* on the Anderson prairie raises some interesting ecological questions which form the basis of this study. First, what are the quantitative and qualitative characteristics of the vegetation of the Anderson prairie? Second, how does the vegetation of the prairie differ from that of a nearby pasture? Third, what is the probable origin of the prairie vegetation?

STUDY SITE

The study area is located on the unglaciated Allegheny Plateau in Lawrence Co. The site is in Mason Twp. approximately one km NE of Symmes Valley High School along State Rt. 141 between the towns of Wilgus and Aid. Universal Trans-Mercator grid coordinates are 425010 m N., 371500 m E. The 7.3 ha site lies between 213 to 250 m in elevation and faces northwest (N 25 W) with an average slope

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of 21%. Gordon (1966) characterizes the presettlement vegetation of the area as mixed oak. The mean annual temperature is 14°C and mean annual precipitation is 106.2 cm at Ironton, 25 km southwest of the prairie (29 yr means, U.S. Environ. Data Serv.).

Soils of the area are of the Gilpin-Dekalb association (Ritchie 1973). The soils at the site are not uniform but differ relative to slope position. The lower two-thirds of the slope have a soil formed from clayey shales and thin bedded limestone. This soil series, Vandalia, is prone to small landslips. Slippage has occurred, and the *Silphium laciniatum* population is found primarily within these disturbances. The upper one-third of the slope has a soil formed from sandstone, and near the Vandalia soil is a thin yellowish brown soil overlying the reddish brown clayey Vandalia soil (Ohio Dept. Natur. Res., pers. comm.).

The site has a long history of human use. In the early part of this century the area was under cultivation. Later the site was used for hay and pasture. It was mowed yearly for most of the years following cultivation until 1970. Since then the site has been used only for pasture. Previous to 1970 fescue (*Festuca* spp.) dominated the site. Since mowing has stopped, little bluestem (*Andropogon scoparius*) has become increasingly conspicuous (D. L. Darling, pers. comm.). It is unknown whether or not the site was in prairie at the time of settlement. Neither Sears (1926), Transeau (1935), Jones (1944) nor Gordon (1966) show evidence for prairies in Lawrence Co.

METHODS AND MATERIALS

The vegetation of the prairie was sampled using a stratified and randomized grid design. A 100-×-105-m grid was marked out on the site, and the corners were permanently marked with steel pipes. Seventy-five randomly chosen one-square-meter quadrats were used to sample the vegetation and the sample was stratified, with 25 quadrats in each of an upper, middle, and lower slope subsample. Within each quadrat, percent cover was estimated for herbs, shrubs, woody vines, mosses, lichens, and exposed soil. Litter depth was measured in each quadrat. Stems of tree species were counted as seedlings if less than one meter in height, as saplings if equal to or greater than one meter but less than 2.5 cm diameter at breast height (DBH), and as trees if greater than 2.5 cm DBH. A random sample of 25 quadrats was also taken from the vegetation in a nearby pasture for comparative purposes. The pasture occupies the same hill as the prairie but is separated from it by .25 km of forest. The pasture slope (17%) faces northwest (N 68 W). Nomenclature for vascular plants follows Gleason and Cronquist (1963).

Quadrats were quantitatively sampled from 13 August to 19 October 1980. Phenological development of the prairie community was determined by identifying each of the species in flower on 4 April, 18 and 25 May, 8 and 29 June, 28 July, 13 and 24 August, 6, 15, and 27 September, and 19 October 1980.

Physical and chemical characteristics of the soil were determined for the prairie and the pasture communities. Two samples from the upper 10 cm of soil were collected in each of the prairie subsamples and from the pasture. After air drying, texture determinations were made using the Bouyoucos hydrometer method (Bouyoucos 1951). Exchangeable cations were extracted in ammonium acetate and the leachate used to determine concentrations of magnesium, calcium, sodium, and potassium ions with a Perkins-Elmer 360 atomic absorption spectrophotometer. Soil pH was measured from a 1:1 soil:water slurry which was allowed to soak overnight and then read on a Beckman Expandomatic pH meter.

RESULTS

A total of 168 species of vascular plants of 59 families were identified for the site. A list of the species not presented in table 1 or table 2 follows in the appendix. The Compositae makes up 19% of the flora followed in decreasing order by the Gramineae (14%), the Fabaceae (6%) and the Rosaceae (4%). *Andropogon scoparius* (little bluestem) has the highest quantitative values for both frequency and abundance (table 1). Weedy species (Buchholtz et al. 1954) such as *Solidago* spp., *Plantago lanceolata, Ipomoea pandurata, Daucus carota, Chrysanthemum Leucanthemum, Achillea Millefolium,* and *Prunella vulgaris* were encountered frequently but were not relatively abundant. *Desmodium* spp., *Carex complanata, Rubus* spp., *Potentilla canadensis,* and *Rhus Copallinum* were both frequent and abundant by comparison. Prairie species are of intermediate to low

TABLE 1

Percent frequency (F), relative frequency (RF), percent cover (C), relative cover (RC), and importance value (IV) of herbaceous and shrub species from quadrats on the O. E. Anderson Compass-Plant Prairie, ranked by total prairie community importance value. Also included are importance values for the prairie subsamples and pasture site. Nomenclature follows Gleason and Cronquist (1963).

	Total Prairie Community					Upper	Middle	Lower	Pasture
Species	F	RF*	C	RC**	IV***	IV	IV	IV	IV
Andropogon scoparius	97.53	5.23	44.16	34.96	20.10	13.33	24.47	25.81	11.78
Desmodium spp.	72.00	3.87	5.57	4.41	4.14	4.75	3.87	3.70	3.23
Carex complanata	73.33	3.94	5.12	4.05	4.00	2.25	3.67	6.70	2.72
Rubus spp.	58.67	3.16	5.91	4.69	3.92	6.61	3.50	1.01	1.82
Potentilla canadensis	86.67	4.66	3.87	3.06	3.86	3.82	3.83	3.97	3.46
Rhus Copallinum	40.00	2.15	5.95	4.71	3.43	6.46	2.92	.30	.76
Hieracium pratense	85.33	4.59	1.59	1.26	2.92	2.96	3.30	2.46	—
Cassia nictitans	65.33	3.51	1.65	1.31	2.41	2.22	2.94	2.06	1.06
Solidago spp.	70.07	3.77	1.09	.87	2.32	1.91	.81	2.19	1.93
Plantago lanceolata	56.00	3.01	1.16	.92	1.97	2.18	2.40	1.22	3.30
Senecio Smallii	54.67	2.94	1.15	.97	1.92	.46	1.72	3.84	.32
Rosa carolina	42.67	2.30	1.85	1.47	1.88	3.20	1.05	1.20	1.11
Daucus carota	49.33	2.65	.67	.53	1.59	1.97	1.65	1.07	2.65
Lespedeza spp.	36.00	1.94	1.51	1.19	1.56	2.75	1.11	.65	1.20
Achillea Millefolium	49.33	2.65	.59	.47	1.56	1.96	1.55	1.09	.68
Ipomoea pandurata	32.00	1.72	1.68	1.33	1.53	2.21	1.11	1.13	1.03
Chrysanthemum Leucanthemum	46.67	2.51	.64	.51	1.51	1.18	1.07	2.35	3.92
Prunella vulgaris	46.67	2.51	.49	.39	1.45	1.52	1.75	.97	1.39
Panicum villosissimum	45.33	2.44	.59	.47	1.45	1.41	1.86	.96	1.74
Sorghastrum nutans	28.00	1.51	1.44	1.14	1.32	2.44	1.05	.30	—
Smilax rotundifolia	25.33	1.36	1.23	.97	1.17	1.88	.34	1.23	.25
Vaccinium stamineum	16.00	.86	1.52	1.20	1.03	1.05	1.10	1.01	—
Vernonia altissima	25.33	1.36	.57	.45	.91	1.26	.95	.44	.92
Galium pilosum	26.67	1.43	.40	.31	.87	1.19	.97	tr†	.32
Veronica officinale	24.00	1.29	.28	.22	.76	.57	.60	1.13	—
Plantago Rugellii	21.33	1.15	.24	.19	.67	.92	.87	.13	.45
Andropogon Gerardi	14.67	.79	.60	.47	.63	—	.27	1.80	—
Cirsium discolor	18.67	1.00	.27	.21	.61	.67	.72	.40	1.31
Gnaphalium spp.	18.67	1.00	.25	.20	.60	1.28	.48	.69	.14
Juncus tenuis	18.67	1.00	.24	.19	.60	.82	.66	.30	.17
Agrostis perennans	17.33	.93	.20	.16	.55	.23	.83	.57	—
Aster lateriflorus	13.33	.72	.45	.36	.54	.42	.37	1.72	1.41
Aster pilosus	14.67	.79	.33	.26	.53	.17	.19	1.32	1.67
Digitaria Ischaemum	10.67	.57	.60	.48	.52	.31	.87	.40	.66
Silphium laciniatum	12.00	.65	.41	.33	.49	—	.27	1.31	—
Danthonia spicata	13.33	.72	.32	.25	.49	.13	.12	1.31	4.85
Eupatorium coelestinum	9.33	.50	.57	.45	.48	.51	.87	—	—
Aster patens	12.00	.65	.24	.19	.42	.29	.49	.48	—
Botrychium dissectum	14.67	.79	.07	.05	.42	.59	tr	tr	—
Oxalis stricta	13.33	.72	.13	.11	.41	1.00	.12	—	.32
Apocynum cannabinum	10.67	.57	.31	.24	.41	.56	.36	.30	—
Poa compressa	12.00	.65	.19	.15	.40	.59	.31	.29	1.61
Festuca spp.	5.33	.29	.63	.50	.39	1.07	—	—	3.74
Lysimachia quadrifolia	12.00	.65	.15	.12	.38	.23	—	.97	—
Hieracium Gronovii	12.00	.65	.13	.11	.38	.13	.12	.94	.14
Sporobolus asper	5.33	.29	.57	.45	.37	.56	.53	—	—
Trifolium repens	8.00	.43	.33	.26	.35	—	.26	.87	.14
Sabatia angularis	10.67	.57	.11	.09	.33	—	—	1.07	.14
Ambrosia artemisiifolia	9.33	.50	.17	.14	.32	.15	.66	.13	.15
Anemone virginiana	8.00	.43	.02	.16	.29	.59	.12	.13	—
Hypericum punctatum	9.33	.50	.09	.07	.29	.23	.55	—	.45
Heuchera americana	6.67	.36	.19	.15	.25	.59	.12	—	—
Viburnum prunifolium	1.33	.07	.53	.42	.25	.66	—	—	—
Triodia flava	6.67	.36	.16	.13	.25	tr	.61	—	1.70
Solanum caroliniense	6.67	.36	.12	.10	.23	.41	.24	—	—
Bidens frondosa	6.67	.36	.08	.06	.21	.23	.26	.13	tr
Euphorbia corollata	5.33	.29	.17	.14	.21	.59	—	—	—
Erigeron philadelphicus	6.67	.36	.08	.06	.21	.25	.36	—	.28

TABLE 1 (continued)

Species	Total Prairie Community					Upper	Middle	Lower	Pasture
	F	RF*	C	RC**	IV***	IV	IV	IV	IV
Linum virginianum	6.67	.36	.07	.05	.21	—	.29	.40	—
Krigia biflora	6.67	.36	.07	.05	.21	.12	.12	.40	.12
Dianthus Armeria	6.67	.36	.07	.05	.21	.35	—	.30	.11
Anagallis arvense	5.33	.29	.04	.03	.16	tr	.36	—	—
Lycopodium complanatum	2.67	.14	.17	.14	.14	—	—	.47	—
Asplenium platyneuron	2.67	.14	.15	.12	.13	.36	—	—	—
Paspalum ciliatifolium	4.00	.22	.07	.05	.13	—	.78	—	.92
Coreopsis major	2.67	.14	.13	.11	.13	—	.37	—	—
Carex glaucodea	4.00	.22	.04	.03	.13	—	—	.40	.80
Taraxacum officinale	4.00	.22	.02	.01	.12	.23	—	tr	.14
Rumex acetosella	9.33	.50	.09	.12	.10	.47	.24	tr	—
Trifolium dubium	2.67	.14	.05	.05	.09	.12	—	.17	—
Lycopus virginiana	2.67	.14	.04	.03	.09	.25	—	—	—
Gillenia stipulata	2.67	.14	.03	.02	.08	—	—	.30	—
Eupatorium serotinum	2.67	.14	.03	.02	.08	—	.24	—	.15
Parthenocissus quinquefolia	2.67	.14	.03	.02	.08	.23	—	—	.12
Lobelia inflata	2.67	.14	.01	.01	.08	.23	—	—	—
Houstonia longifolia	2.67	.14	.01	.01	.08	.12	—	tr	.82
Vitis spp.	1.33	.07	.53	.05	.06	.17	—	—	—
Trifolium pratense	6.67	.36	.12	.09	.06	.12	.78	tr	.29
Juncus effusus	1.33	.07	.04	.03	.05	—	.15	—	—
Andropogon virginicus	1.33	.07	.03	.02	.04	—	—	.15	—
Aster paternus	1.33	.07	.03	.02	.04	—	—	.15	—
Pycnanthemum flexuosum	1.33	.07	.03	.02	.04	—	.12	—	—
Cyperus acuminatus	1.33	.07	.03	.02	.04	—	.14	—	—
Polystichum acrosticoides	1.33	.07	.01	.01	.04	.12	—	—	—
Panicum virgatum	1.33	.07	.01	.01	.04	—	.12	—	—
Lysimachia Nummularia	1.33	.07	.01	.01	.04	—	.19	—	—
Setaria geniculata	1.33	.07	.01	.01	.04	—	.19	—	1.49
Echinochloa pungens	1.33	.07	.01	.01	.04	—	.12	—	—
Cuphea perfoliata	1.33	.07	.01	.01	.04	—	.12	—	—
Eragrostis spectabilis	1.33	.07	.01	.01	.04	—	.12	—	.14
Campsis radicans	1.33	.07	.01	.01	.04	—	.12	—	—
Asclepias spp.	2.67	.14	tr	—	—	tr	tr	—	—
Agrimonia pubescens	1.33	.07	tr	—	—	tr	—	—	—
Plantago aristata	1.33	.07	tr	—	—	tr	—	—	—
Viola spp.	2.67	.14	tr	—	—	tr	—	—	—
Spiranthes gracilis	1.33	.07	tr	—	—	—	tr	—	—
Muhlenbergia Schreberi	1.33	.07	tr	—	—	—	tr	—	—
Polygonum spp.	1.33	.07	tr	—	—	—	tr	—	—
Acalypha gracilens	1.33	.07	tr	—	—	—	tr	—	.38
Ascyrum Hypericoides	4.00	.22	tr	—	—	—	—	tr	—
Physalis virginiana	1.33	.07	tr	—	—	—	—	tr	.12
Melilotus alba	1.33	.07	tr	—	—	—	—	tr	.86
Euphorbia maculata	4.00	.22	tr	—	—	tr	tr	—	.68
Draba verna	1.33	.07	tr	—	—	—	—	tr	.12
Diodia teres	—	—	—	—	—	—	—	—	.69
Ruellia caroliniensis	—	—	—	—	—	—	—	—	.77
Aristida longispica	—	—	—	—	—	—	—	—	1.19
Sporobolus vaginiflorus	—	—	—	—	—	—	—	—	1.39
Cichorium intybus	—	—	—	—	—	—	—	—	.12
Lonicera japonica	—	—	—	—	—	—	—	—	.91
Aristida oligantha	—	—	—	—	—	—	—	—	.71
Mosses and lichens	86.67	4.55	17.72	14.03	9.35	10.17	9.92	8.03	9.51
Exposed soil	32.00	1.72	4.08	3.23	2.48	1.00	1.29	5.83	8.60
Litter depth (cm)			2.44			2.20	3.06	2.06	1.98

$$*RF = \frac{\%\text{ frequency for 1 species}}{\text{sum of \% frequency for all species}} \times 100$$

$$**RC = \frac{\%\text{ cover for 1 species}}{\text{sum of \% cover for all species}} \times 100$$

$$***IV = \frac{RF + RC}{2}$$

†tr = less than 1% cover

relative importance in the community with the exception of *Andropogon scoparius* and *Sorghastrum nutans*. In addition to vascular plant species, mosses and lichens were frequent and abundant between the grass clumps.

Species distributions tended to vary relative to slope position. The subdominants of *Andropogon scoparius* on the upper slope are *Rubus* supp., and *Rhus Copallinum*. On the middle and lower slope *Rosa carolina* and *Carex complanata* are subdominant. The *Silphium laciniatum* population is found at mid to lower slope primarily in an area of soil slippage. The population is successfully reproducing by seed (Auffenorde and Wistendahl 1983). This species was not observed on the upper part of the slope.

There are a total of 98 stems of 11 tree taxa in the prairie and pasture communities (table 2). Of these, only *Pinus virginiana, Crataegus* spp., and *Sassafras albidum* are common to the two sites. *Cornus florida* occurs in the pasture sample but not the prairie sample. *Pinus virginiana* and *Crataegus* stems are most abundant, 30 and 35 respectively. The pine is found in all samples but is more abundant in the prairie subsamples than in the pasture. The upper subsample had the most species (7) and the highest frequency of stems (19) represented in the sample. *Crataegus* stems less than one meter tall are well represented in the middle slope subsample. All of the species occur with low frequencies, the middle slope and pasture having the lowest total stem frequencies.

The upper subsample of the prairie is the richest in species with 82 (table 3). The middle and lower slopes had richness values of 80 and 69, respectively. The pasture falls between these at 73. The Shannon-Weaver index, H′, also decreases from the upper to the lower slope. The pasture has the highest H′ value, (1.55), due to a more equitable (.361) distribution of the abundances among the species.

The log normal distributions observed in dominance-diversity curves of the samples (data not shown) suggest that the relative cover of a species is determined by

TABLE 2

Number of stems of seedlings (<1 m in height), saplings (>1 m but <2.5 cm dbh), and trees (>2.5 cm dbh) by subsamples of 25, 1m² quadrats from the O. E. Anderson Compass-Plant Prairie and a nearby pasture site in Lawrence Co., Ohio. Frequency values are given in parentheses. Nomenclature follows Gleason and Cronquist (1963).

	Prairie									
	Upper			Middle		Lower		Pasture		Total
Species	Se	Sa	Tr	Se	Sa	Se	Sa	Se	Sa	Stems
Pinus virginiana	4(1)	8(5)	2(2)	3(3)	4(3)	6(6)	2(2)	1(1)		30(23)
Acer rubrum	4(3)	2(2)								6(5)
Diospyros virginiana	5(1)			1(1)		1(1)				7(3)
Fraxinus americana	2(2)									2(2)
Prunus serotina	1(1)									1(1)
Morus alba	1(1)									1(1)
Platanus occidentalis		1(1)								1(1)
Crataegus spp.				20(1)		6(2)		4(4)	5(2)	35(9)
Sassafras albidum				4(1)		1(1)		1(1)		6(3)
Ulmus americana						5(1)				5(1)
Cornus florida									4(1)	4(1)
Total stems	17(9)	11(8)	2(2)	28(6)	4(3)	19(11)	2(2)	6(6)	9(3)	98(50)
		30(19)		32(9)		21(13)		15(9)		
				83(41)						

TABLE 3

Species richness (N), Shannon-Weaver diversity (H') and Pielou's index of equitability (J) for subsamples of 25, 1m² quadrats from the O. E. Anderson Compass-Plant Prairie and a nearby pasture site in Lawrence Co., Ohio.

	N	H'	J
Prairie			
Upper	82	1.54	.349
Middle	80	1.44	.329
Lower	69	1.34	.316
Pasture	73	1.55	.361

a number of independent variables that have different effects on different species (Whittaker 1975). Although all of the curves are similar in shape, the pasture sample has the strongest horizontal tendency as a result of the more equitable distribution of abundance values among the species. The lower slope subsample of the prairie has the least equitable distribution of abundances among species and the strongest vertical tendency.

Sorenson's similarity indices were calculated using the presence or absence of species, cover values of species, and importance values of species. The indices for species presence or absence do not differ greatly among themselves for all samples. However, there is generally less similarity between prairie and pasture when quantitative values are considered (data not shown). Thus the vegetative differences between the two communities are more quantitative than qualitative. The primary qualitative difference is the lack of prairie vegetation in the pasture.

Phenologically, there were three flowering pulses at the prairie during 1980 (fig. 1). One occurs in late May-early June and the others in early and late August. The August pulses included the largest number of species (41). The phenological pattern observed reflects the pattern of the perennial members of the community. Annuals have flowering peaks in late June and early August. The late June peak of annual species coincides with a decline in spring flowering perennials while the late August peak coincides with the perennial species' peak for the season.

Graminaceous species have two distinct periods of flowering activity, late May and late August (fig. 2). The Compositae are

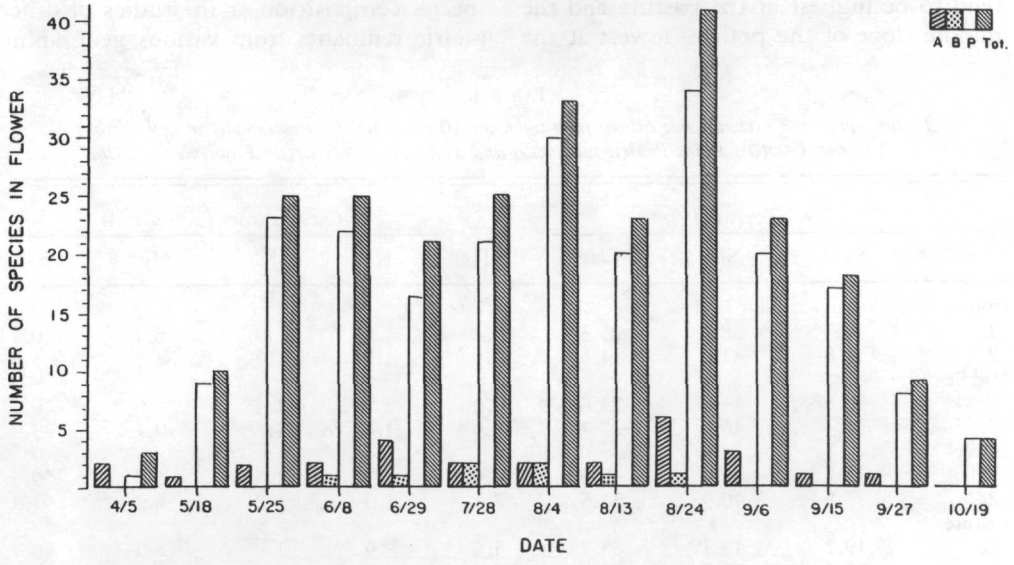

FIGURE 1. Flowering phenology for vascular plant species from the O. E. Anderson Compass-Plant Prairie. A = annuals, B = biennials, P = perennials, and T = total sample.

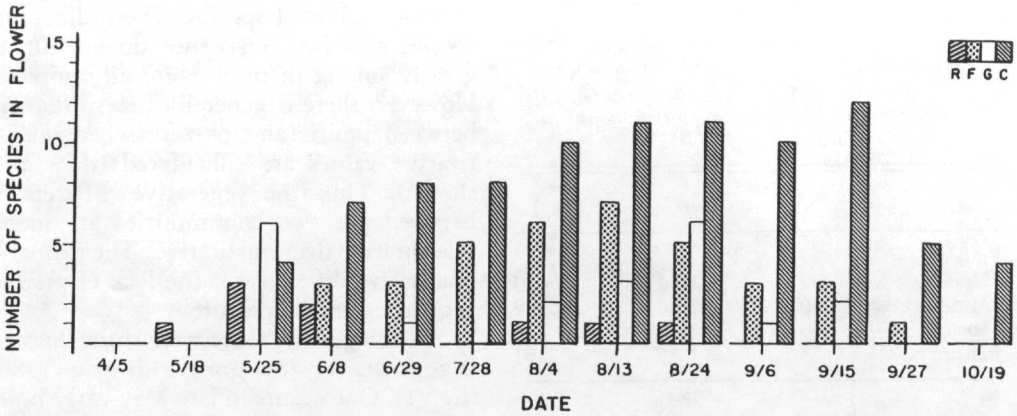

FIGURE 2. Flowering phenology for selected vascular plant families at the O. E. Anderson Compass-Plant Prairie. R = Rosaceae, F = Fabaceae, G = Gramineae, and C = Compositae.

well represented in the aestival and autumnal periods. The Fabaceae are primarily an aestival family with a peak of flowering activity in mid-August. In contrast, the Rosaceae are vernal in flowering phenology with a late May peak.

Soil textures determined for the prairie are loams or clay loams which tend to be silty at the lower slope and sandy on the upper slope (table 4). The soil texture of the pasture is similar to that of the lower prairie subsample. Exchangeable cations tend to be highest at the pasture and the middle slope of the prairie, lowest at the upper slope of the prairie. The calcium values greater than 25 are probably a consequence of limestone shards in the soil sample. The prairie soils were generally more acidic than those of the pasture.

DISCUSSION

The flora of the Anderson prairie is dominated by *Andropogon scoparius* with a sedge species (*Carex complanata*) and shrubs as subdominants. The Compositae and Gramineae numerically dominate the species composition as in studies of other prairie remnants from various geographic

TABLE 4

Texture, pH, and exchangeable cations from the upper 10 cm of soil for two samples in each of the O. E. Anderson Compass-Plant Prairie subsamples and a nearby pasture site in Lawrence Co., Ohio.

	Texture (%)				Cations (meq/100 g soil)			
	Sand	Silt	Clay	pH	Na	K	Mg	Ca
Upper								
1.	46.7	28.0	25.3	4.8	.8	.9	6.1	20.1
2.	56.8	31.6	11.5	4.9	1.5	.7	1.5	3.6
Middle								
1.	34.3	43.9	21.8	5.0	2.2	1.4	4.9	16.2
2.	26.3	46.0	27.7	4.9	1.1	1.7	9.7	23.9
Lower								
1.	15.5	44.9	39.6	4.9	.7	1.5	6.7	59.4
2.	27.5	40.9	31.6	7.1	1.0	1.2	6.7	41.4
Pasture								
1.	19.2	45.1	35.7	5.8	.9	1.8	8.5	46.1
2.	30.4	33.8	35.8	6.6	1.6	1.4	10.6	68.7

localities (Freckmann 1966, Schuster and McDaniel 1975, Bryant 1977, Irving et al. 1980). The Anderson prairie resembles those on Cedarville dolomite in Adams Co., Ohio, described by Braun (1928), in being dominated by *Andropogon scoparius.* Floristically the Anderson prairie closely resembles a nearby pasture. Its uniqueness is based on the presence of true prairie species such as *Andropogon Gerardi, Sorghastrum nutans, Panicum virgatum,* and especially *Silphium laciniatum;* species not generally known from pastures and old-fields of the region (McConnell 1963, Toye and Wistendahl 1972).

The August peak of flowering activity at the Anderson prairie is several weeks later than that of more western prairie (Steiger 1930, Ahshapanek 1962, Lynch 1962, Anderson and Schelfhout 1980). An Oklahoma site studied by Anderson and Adams (1978) had floral peaks in late May and early September. The wetter sites in a Nebraska prairie resembled the Anderson prairie, with peak flowering in August (Steiger 1930).

The soils of the Anderson prairie show a trend of increasing sand content with increasing elevation. The sandier upper slope soil represents sandstone derived colluvium overlying Vandalia series soils characteristic of the middle and lower slope. The change from pine-hardwood forest to prairie along the border of the prairie is the result of past land use patterns and not edaphic characteristics, in contrast to the distinct soil-vegetation relationships of the Buffalo Beats prairie in Athens Co., Ohio (Wistendahl 1975).

The diversity of tree species observed and the abundance of saplings and shrubs indicate that a successional transition of the prairie to pine-hardwood forest will occur in the absence of management to control growth of woody species. Loss of prairie to forest has been well documented for the prairies of Adams Co., Ohio (Annala et al. 1983, Annala and Kapustka 1983). These authors also comment on the necessity of management to control woody species growth in the maintenance of prairie communities.

The origin of prairie vegetation at this site is problematic. Because the site was cultivated in the past, the original vegetation was severely disturbed, and the current vegetation originated primarily from species which invaded or were somehow introduced to the site. Cultivation has an adverse effect on prairie vegetation, which can be totally destroyed after five years of annual plowing (Penfound and Rice 1957). The prairie grasses present at this site have been previously recorded for the county (Cusick and Silberhorn 1978) and could have migrated to this site from surrounding habitats. The Anderson Prairie does not show the kind of resistance to the establishment of woody plants seen in the Buffalo Beats prairie in Athens Co. (Wistendahl 1975). In addition, some present day prairie remnants in Adams Co., Ohio, are located on previously cultivated or pastured land (Annala and Kapustka 1983). Thus, in many respects, the prairie could be interpreted as successional pasture supporting adventive prairie species rather than remnant prairie. Conversely, the evidence could be interpreted in terms of this site representing a severely disturbed and degraded prairie remnant.

The presence of *Silphium laciniatum* in the community is not as easily explained by invasion from surrounding habitats. Populations of *Silphium laciniatum* have been reported for the central and west-central counties of Ohio (Riddell 1835, Cusick 1978, King 1978). Presumably these were destroyed by intensified agricultural activities in the last half of the 19th and early 20th centuries. The first report of this Lawrence Co. population was made by Fisher (1966), and currently the nearest neighboring population is in central Indiana. The seed, while flattened and potentially wind dispersed, are not likely to have been blown the distance necessary to establish this population. The area may have been seeded into pasture following cultivation, and this prairie species and

others were introduced as contaminants in the seed. Migration from an unknown station of this species cannot be discounted. Also, the possibility that someone introduced the plant intentionally should not be overlooked. Once established, and if not destroyed, *Silphium laciniatum* persists in a community. Goulds (1941) found that *Silphium laciniatum* retained 95% fidelity to the original prairies of Wisconsin as mapped by surveyors at the time of settlement. Although a definite explanation for the origin of the prairie vegetation at this site is not possible, the prairie species may be adventive as a consequence of agricultural activities.

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APPENDIX

List of species at the O. E. Anderson Compass-Plant Prairie not given in table 1 or table 2. Nomenclature follows Gleason and Cronquist (1963).

Typhaceae
Typha latifolia

Gramineae
Festuca elatior
F. paradoxa
Poa nemoralis
Dactylis glomerata
Phleum pratense
Panicum dichotomum
P. commutatum

Cyperaceae
Carex vulpinoidea

Juncaceae
Juncus articulatus

Iridaceae
Sisyrinchium angustifolium

Orchidaceae
Spiranthes vernalis

Salicaceae
Salix nigra

Juglandaceae
Carya ovata

Fagaceae
Quercus velutina

Polygonaceae
Rumex obtusifolius
Polygonum pensylvanicum

Caryophyllaceae
Cerastium nutans

Magnoliaceae
Liriodendron tulipifera

Berberidaceae
Podophyllum peltatum

Cruciferae
Cardamine hirsuta

Caesalpiniaceae
Cercis canadenis

Fabaceae
Trifolium procumbens
Desmodium marilandicum
D. rigidum
D. paniculatum
Lespedeza virginica

Geraniaceae
Geranium columbinum

Onagraceae
Ludwigia alternifolia
Epilobium coloratum
Oenothera perennis

Cornaceae
Nyssa sylvatica

Ericaceae
Oxydendrum arboreum
Vaccineum pallidum

Asclepiadaceae
Asclepias syriaca
A. incarnata
A. tuberosa
A. viridiflora

Verbenaceae
Verbena urticifolia

Labiatae
Scutellaria Leonardii

Scrophulariaceae
Penstemon calycosus
Linaria vulgaris

Bignoniaceae
Catalpa speciosa

Plantaginaceae
Plantago virginica

Rubiaceae
Houstonia caerulea

Compositae
Rudbeckia hirta
Solidago juncea
S. nemoralis
Erigeron pulchellus
Gnaphalium purpureum
G. obtusifolium
Antennaria plantaginifolia
Eupatorium purpureum
Arctium minus
Prenanthes sp.
Lactuca canadensis